REMARKS

Claims 1-30 are pending in the present application. By this response, claims 1-4, 9, 11-14, 19-24 and 29 are amended. Claims 1, 11 and 21 are amended to recite "wherein the step of swapping out of the memory region is performed while inhibiting further operations to the memory region." Support for these amendments may be found in the specification at least on page 38, lines 13-31. Claims 2-4, 9, 12-14, 19, 21-24 and 29 are amended to use "quiescent", which is the adjective form of "quiesce." Claim 20 is amended for proper spelling. Reconsideration of the claims in view of the above amendments and following remarks is respectfully requested.

Amendments were made to the specification to correct errors and to clarify the specification. No new matter has been added by any of the amendments to the specification.

I.   Examiner Interview

Applicants thank Examiner Kim for the courtesies extended to Applicants' representative during the June 29, 2004 telephone interview. During the interview, the above amendments were discussed. Examiner Kim stated he would consider the issues and proposed amendments argued by the Applicants. The substance of the interview is summarized in the remarks of Section III, which follows.

II.   Objection to Specification

The Office Action objects to the title of the invention as not being descriptive. Applicants respectfully submit that current title of the invention "Apparatus and Method for Swapping-Out Real Memory by Inhibiting I/O Operations to a Memory Region" is descriptive of the invention as claimed. Applicants further request that the Examiner believes the title is not descriptive, the Examiner provide a complete example of a title, which the Examiner thinks is more descriptive.

III.   35 U.S.C. § 102, Alleged Anticipation, Claims 1-5, 9, 11-15, 19, 21-25 and 29

The Office Action rejects claims 1-5, 9, 11-15, 19, 21-25 and 29 under 35 U.S.C. § 102(a) as being allegedly anticipated by Martin et al. (U.S. Patent No.6,658,522). This rejection is respectfully traversed.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. In re Bond, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of the claimed invention must be considered when determining patentability. In re Lowry, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). Applicants respectfully submit that Martin does not identically show each and every feature of the claims arranged as they are in the claims. Specifically, Martin does not swap out the memory region while inhibiting further operations to the memory region, if the current number of outstanding operations to the memory region is zero.

Martin is directed to a method for reducing overhead associated with system input output operations in a computer system having a plurality of processors and a physical memory accessed and used by the plurality of processors. The method includes creating a pinned virtual memory range database in which is stored virtual memory address information corresponding to pinned physical memory for each applications program being run on the computer system.

Thus, in the system of Martin, in order to perform an I/O operation from virtual memory to/from physical memory, the system initially obtains a PFD lock, which locks all physical memory of a given machine or computer system (see column 3, lines 21-25). Then a physical memory page lock is initiated for each page of physical memory corresponding to the virtual memory pages or addresses to be read/inputted to or written/outputted from, which locks the contents of the physical memory page so that the contents cannot be swapped or the physical page remapped (see column 3, lines 17-21 and column 3, line 65 to column 4, line 3). Also, a reference counter, used to indicate the

locked or unlocked status of each page, is incremented (see column 3, line 65 to column 4, line 3). After each physical memory page that is associated with an I/O operation in the buffer at the time the PFD lock was obtained has been locked, the operating system releases the system wide PFD lock (see column 4, lines 3-13). At this point the I/O operations transferring the virtual memory to/from the locked physical memory pages may occur (see column 4, lines 19-31) and other I/O operations may be buffered (see column 4, lines 29-31). After the I/O operations have been completed, another system wide global PFD lock, which <u>locks all physical memory of a given machine or computer system, is obtained</u> (see column 4, lines 48-50). The reference counter is verified to read zero, so that the physical memory page may be unlocked (see column 4, lines 54-56). The physical memory page is unlocked (see column 4, lines 50-53). Then, only after every physical memory page is unlocked, will the system wide global PFD lock be released, which will then allow the contents of the physical memory page to be swapped or remapped.

Applicants respectfully submit that Martin does not teach swapping out the memory region while inhibiting further operations to the memory region, if the current number of outstanding operations to the memory region is zero. The Office Action alleges that Martin teaches this feature at column 4, lines 55-59, which reads as follows:

> This generally means that the locked/unlocked page reference counter in the PFD is decremented so the reference counter value is zero, so as to indicate that the associated physical memory page is un-locked or un-pinned such that the contents can be swapped or the physical page remapped at a later time.

While this section indicates that the contents of the physical memory page may be swapped once the physical memory page is unlocked, Martin still has a system wide global PFD lock initiated which <u>locks all physical memory of a given machine or computer system</u>. Thus, until the system wide global PFD lock is released, the contents of the physical memory page may not be swapped. In contradistinction, the instant claim recites "swapping out the memory region if the current number of outstanding operations to the memory region is zero, wherein the step of swapping out of the memory region is performed <u>while inhibiting further operations to the memory region</u>."

Furthermore, Martin does not teach determining if a current number of outstanding operations to the memory region is zero. The Office Action alleges that this feature is taught by Martin at column 4, lines 55-56, shown above. In this section, Martin merely teaches a reference counter, which indicates the locked or unlocked status of each page (see column 3, lines 66-67). Additionally, the reference counter indicates the locked or unlocked status of each page at the time the PFD lock was obtained. As discussed above, once the physical memory page has been locked and the PFD lock is released, other I/O operations may be performed and sent to an I/O buffer. Thus, Martin teaches a reference counter that indicates the locked or unlocked status of each page at a point in time.

Martin simply is not relevant to the claimed invention beyond merely instructing a process to inhibit further operations to a memory region. That is, Martin simply does not teach determining if a current number of outstanding operations to the memory region is zero, and swapping out the memory region if the current number of outstanding operations to the memory region is zero, wherein the step of swapping out of the memory region is performed while inhibiting further operations to the memory region. Thus, Applicants respectfully submit that Martin does not teach all of the features of independent claims 1, 11 and 21.

Consequently, Martin does not teach each and every feature of independent claims 1, 11, and 21 as is required under 35 U.S.C. § 102. At least by virtue of their dependency on independent claims 1, 11 and 21, each and every feature of dependent claims 2, 8-10, 15 and 21-23 is not taught by Martin. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 1-5, 9, 11-15, 19, 21-25 and 29 under 35 U.S.C. § 102.

Moreover, in addition to their dependency from independent claims 1, 11 and 21, the specific features recited in dependent claims 2-5, 9, 12-15, 19, 22-25 and 29 are not taught by Martin. For all of the claims, the Examiner alleges that the reference count value taught by Martin at column 4, lines 54-59 is the same as a quiescent indicator. As discussed above, the reference counter indicates the locked or unlocked status of each page. However, claims 2, 12 and 22 recite a quiescent indicator which states that the guest should quiesce outgoing I/O's against that memory region, i.e. no further operations

are initiated or executed. As shown above, even though the reference counter is
incremented and the physical memory page is locked, once the PFD lock is released,
other I/O instruction may be buffered. Thus, Martin does not teach the specific features
of claims 2-5, 9, 12-15, 19, 22-25 and 29, as all of the claims include a quiescent
indicator.

Therefore, in addition to being dependent on independent claims 1, 11 and 21,
dependent claims 2-5, 9, 12-15, 19, 22-25 and 29 are also distinguishable over Martin by
virtue of the specific features recited in these claims. Accordingly, Applicants
respectfully request withdrawal of the rejection of claims 2-5, 9, 12-15, 19, 22-25 and 29
under 35 U.S.C. § 102.

IV.   35 U.S.C. § 103, Alleged Obviousness, Claims 6-8, 10, 16-18, 20, 26-28 and 30

The Office Action rejects claims 6-8, 10, 16-18, 20, 26-28 and 30 under 35 U.S.C.
§ 103(a) as being unpatentable over Martin et al. (U.S. Patent No. 6,658,522) in view of
Cutts, Jr. et al. (U.S. Patent No. 5,890,003). This rejection is respectfully traversed.

Claims 6-8, 10, 16-18, 20, 26-28 and 30 are dependent on claims 1, 11 and 21,
and thus, are distinguished over Martin for at least the reasons noted above with regard to
claims 1, 11 and 21. Moreover, Cutts does not provide for the deficiencies of Martin and
thus, any alleged combination of Cutts and Martin would not be sufficient to reject
independent claims 1, 11 and 21 or claims 6-8, 10, 16-18, 20, 26-28 and 30 by virtue of
their dependency. That is, Cutts does not teach determining if a current number of
outstanding operations to the memory region is zero and swapping out the memory
region if the current number of outstanding operations to the memory region is zero,
wherein the step of swapping out of the memory region is performed while inhibiting
further operations to the memory region.

Moreover, the Office Action may not use the claimed invention as an "instruction
manual" or "template" to piece together the teachings of the prior art so that the invention
is rendered obvious. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992).
Such reliance is an impermissible use of hindsight with the benefit of Applicant's
disclosure. *Id.* Therefore, absent some teaching, suggestion, or incentive in the prior art,

Martin and Cutts cannot be properly combined to form the claimed invention. As a result, absent any teaching, suggestion, or incentive from the prior art to make the proposed combination, the presently claimed invention can be reached only through an impermissible use of hindsight with the benefit of Applicants' disclosure a model for the needed changes.
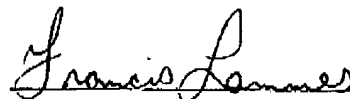
In view of the above, Applicants respectfully submit that Martin and Cutts, taken alone or in combination, fail to teach or suggest the features of claims 6-8, 10, 16-18, 20, 26-28 and 30. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 6-8, 10, 16-18, 20, 26-28 and 30 under 35 U.S.C. § 103(a).

V.   Conclusion

It is respectfully urged that the subject application is patentable over the prior art of record and is now in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

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